

Gurmail Singh

VPO Lohari Ragho, Narnaund, Hisar, Haryana, India- 125039

✉ gurmail.gurmail@students.iiserpune.ac.in

☎ (+91) 805-905-5733

Education

(2016 - 2022)

[Indian Institute of Science Education and Research \(IISER\), Pune](#)

BS(Bachelors in Science)-MS(Masters in Science) Dual Degree

- Major – Biological Sciences
- AGPA – 8/10 (Master's thesis Grade)

(2015)

[Govt Sr. Sec. School, Hansi](#)

Higher Secondary School Certificate (XIIth Standard), HBSE

- Subjects – Physics, Chemistry, Biology, English
- Percentage – 82.4%

Research Experience

Course: **Masters' Project Student:**

(Feb 2021-Present)

Place: [Pucadyil Lab, IISER Pune](#)

Supervisor: **Prof. Thomas Pucadyil**

- **Questions asked:** The aim of this project includes 1) systematically testing its membrane binding determinants, 2) determining its GTP-hydrolysis activity in the presence of relevant liposomes, 3) understanding its ability to remodel membranes
- **Rationale:** Vps1, a GTPase that belongs to the dynamin superfamily in yeast, is involved in vacuole protein sorting, endocytosis, and maintaining peroxisome morphology. Dynamin superfamily proteins are involved in membrane-active processes such as fusion and fission. Cellular studies suggest Vps1 deletion disrupts vacuolar fission.
- **Observations:** Purified Vps1 shows preferential binding to PI(3)P and PI(4,5)P₂ among phosphoinositides and cardiolipin (CL) among anionic phospholipids. Binding to liposomes containing these lipids results in stimulation of its GTPase activity. Using templates of supported membrane nanotubes that mimic the necks of budded transport vesicles and tubular peroxisomes, I find that Vps1 can catalyze the fission of PI(3)P and PI(4,5)P₂-containing membranes but fails to do so on CL-containing membranes. To the best of our knowledge, this constitutes the first report demonstrating membrane fission by Vps1, and that fission is lipid-specific.
- **Skills Learned:** Epifluorescence microscopy, Mammalian cell culture, Preparation of model membranes such as liposomes, supported lipid bilayers, supported membrane nanotubes, Membrane-binding assays – Liposome co-sedimentation, Dot-blot, Proximal Labeling of Membrane-Associated Proteins, Yeast cell culture, cloning, generation of stable transformants and live-imaging of yeast cells, Protein- Biochemistry: Protein purification using affinity or ion-exchange chromatography, Western Blotting, Pull-downs using various matrices displaying bait proteins, protein-estimation and inorganic-phosphate estimation (malachite-green based) using colorimetric assays, Genomic-DNA isolation, Plasmid DNA isolation (without commercial kits).

Course: **Semester Project Student**

(Aug 2019 -Mar 2020)

Place: **Neuronal Connectivity Laboratory, IISER Pune**

Supervisor: **Dr. Aurnab Ghose**

- **Questions asked:** The objective of this project was to test the role of srGAP2 in filopodia formation and potential interaction with Formin2.
- **Rationale:** Axonal Branching is a process of multiple players and is controlled at multiple levels. One player in this process is Formin 2, which helps in growth cone guidance and axonal branching initiation (formation of filopodial structure). srGAP2 is a protein that helps in bending membranes. The aim of this project includes; Cloning of srGAP2 in chick-specific vectors and overexpressing it in chick neurons to visualize their cellular localization and their effect on filopodial formation.
- **Skills Learned:** dissection of chick embryos and primary-neuronal culture, transient transfections, and fixed-cell & live-cell imaging of primary neurons. PCR-based cloning – Restriction-digestion based, Epifluorescence microscopy.

Courses (till Semester 8)

- Biology: Biology of Systems, Genetics, Advanced Cell Biology, Advanced Molecular Biology, Epigenetics, , Evolution, Genome Biology, Advanced Immunology, Microbiology, Ecology, Biostatistics, Advanced Biochemistry, Biology and Disease, Developmental Biology,, 3 Lab courses, 4 Lab projects
- Chemistry: Basic Theory and Lab courses
- Physics: Basic Theory and Lab courses
- Mathematics: Basic Theory and Lab courses
- Other Courses: Introduction of Computing, Mathematical Methods, Critical Reading and Communication, Earth System, History of Science and Technology, Introduction to Development Studies, Disasters and Development

Academic Achievements

- Kishore Vaigyanik Protsahan Yojna (KVPY) fellow (<http://www.kvpy.iisc.ernet.in/>)
 - Prestigious Fellowship Given to Academically excellent students
 - Access to all National laboratories and libraries
- Secured marks among top 1% candidates in Higher Secondary State Board Examination.
- Infosys Foundation Scholarship (2020-2021)
 - One among 15 students to be selected for this fellowship
 - Partial waiver of tuition fee for that year

Skills

Experimental Skills:

- PCR-based cloning – Restriction-digestion-based and Restriction-free cloning.
- Genomic-DNA isolation, Plasmid DNA isolation (without commercial kits).
- Yeast cell culture, cloning, generation of stable transformants, and live-imaging of yeast cells.
- Protein- Biochemistry: Protein purification using affinity or ion-exchange chromatography, Western Blotting, Pull-downs using various matrices displaying bait proteins, protein estimation, and inorganic-phosphate estimation (malachite-green based) using colorimetric assays.
- Preparation of model membranes such as liposomes supported lipid bilayers and supported membrane nanotubes.(Dar S, Kamerkar SC, Pucadyil TJ. A high-throughput platform for real-time analysis of membrane fission reactions reveals dynamin function. Nat Cell Biol. 2015 Dec;17(12):1588-96. doi: 10.1038/ncb3254. Epub 2015 Oct 19. PMID: 26479317.)
- Membrane-binding assays – Liposome co-sedimentation, Dot-blot, Proximal Labeling of Membrane-Associated Proteins (Jose GP, Pucadyil TJ. PLiMAP: Proximity-Based Labeling of Membrane-Associated Proteins. Curr Protoc Protein Sci. 2020 Sep;101(1):e110. doi: 10.1002/cpps.110. PMID: 32603530.)
- Mammalian cell culture, dissection of chick embryos and primary-neuronal culture, transient transfections, and fixed-cell & live-cell imaging of primary neurons.
- Expertise in handling Epifluorescence microscope and Confocal Microscope.

Computational Skills:

- Operating System - Linux, Windows, macOS
- Microsoft Word, Microsoft Excel, Microsoft PowerPoint, R, Chimera, Snapgene, GraphPad, ImageJ
- Programming Languages - R, Python

Extra-Curricular and Personal Skills:

- Organizational skills gained as Coordinator for IISER Pune's annual fest Karavaan.
- Good team skills were gained by working in a research group consisting of more than ten people.
- Good communication skills gained throughout the course curriculum and presentations.
- Languages – English, Hindi, Punjabi